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IS THE WORLD LIVING OR DEAD?

THE TROUBLE
WITH SCIENCE

by
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questions, and someone spoke wonderingly of the fact that there were so many religions in the world.

'But the Truth is One,' the priest replied.

That raised an old anti-theist red flag: it sounded too nice and easy to be true. I wanted to see more evidence. I find I want that more than ever, nowadays. I still appreciate the power of science to take on the ultimate questions, and the rigorous beauty of some of its hypothetical answers. I'm inspired by the scientists who are challenging the reductionist and mechanistic dogma of their disciplines. But I'm afraid they may always be the minority report. If science remains dominated by the lure of power over matter, or the belief that its own abstractions are the ultimate reality, it will never be able to find the evidence I seek, or weave us back into the story of, a single, living world.

Recommended Works:

Lee Smolin, *The Trouble with Physics; Time Reborn*

Rupert Sheldrake, *The Science Delusion* (US title: *Science Set Free*)

Stuart Kauffman, *At Home in the Universe; Reinventing the Sacred*

James Gleick, *Chaos: The Making of a New Science*

David Bohm, *Wholeness and the Implicate Order*

Paul Feyerabend, *Against Method* and *The Tyranny of Science*

Vine Deloria Jr., *Evolution, Creationism and Other Modern Myths*

Their own mathematics warns scientists that their solutions to complex or ‘non-linear’ problems can only be so approximate as to be useless in most cases. A more profound insight that can be derived from them is how a finite natural system can contain and be bounded by almost infinite complexity, and thus, how sensitive it is to change. Emerging systems theories, like biologist Stuart Kauffman’s, are just beginning to sketch the minority report on irreducible complexity – while the reductionist consensus, with vast resources to back it up, gallops on towards the machine dreams of its venture capitalists and ‘visionaries’.

There is a warning bell ringing loudly now in our ears: reality eludes all efforts to reduce it too much, or to use only formalisms to describe it. It seems to be trying to tell the scientists who will listen that things in connection with one another, evolving in time, are not just different in scale from things studied in isolation but *fundamentally different in kind*. Time has lost all fundamentality in mainstream theoretical physics. And yet time not only rules our human lives and everything our senses can perceive, but its flow is somehow essential in creating this qualitative difference.

If scientists took time seriously enough, they might even find it to be capable of altering the rules by which physical change happens (Smolin is one of a small group of theoretical physicists considering this idea. And Sheldrake has also proposed that ‘nature may have habits rather than laws’). But the scientific method constrains science to isolate things in space and remove them from the passage of time in order to make statements about them, to act upon them. It’s highly unlikely that a discipline thus constrained will be able to permit the notion that the cosmos itself is alive, for life is characterised not just by a set of molecules but by its particular relationship to the flow of time.

Humans remain on a trajectory that is predominantly profoundly anti-social, hubristic, and mechanistic. But if we fail as a species, it won’t be because our theoretical physics wasn’t good enough, or our theories of consciousness, our engineering, technology, medicine – or even our art, music, or literature. It will be because the stories we accepted as most profoundly true, the ones that determined our social behaviour, dismissed the idea that treating the world as dead would ultimately be deadly to us too.

In a mountain village in Peru once, I met an old man who was introduced to me as an Inca priest. (The Inca civilisation is long gone, of course, but like the Mexica and Maya, those who call themselves its descendants continue trying to keep its philosophy alive.) The priest was baking bread; that was his daily work in the village. In his view the mountains that towered over our heads were just as alive as the birds that sang in the scrub trees, the loaves of bread he pulled from the clay oven, or any of us. I was with a group of people who were interested in what they called spiritual

All myth, all deep insight, means the same as and no more than the falling of the solar system on its long parabola through space. -Kenneth Rexroth

I spent the beginning of this year immersed in works of popular science. Completely absorbed, the way I have been by few works of fiction. Hours spent poring over books and articles on chaos theory, cosmology, string theory, stopping only to try to imagine some consequence or take note of some insight. Why, I had to ask myself, do I care so passionately about the arcane world of theoretical physics? Science had never been my talent or my discipline; my math was poor, my academic studies were in that softest of all subjects: literature. But for many years I had had these bouts of real absorption with the ideas of science, particularly physics. I realised it had something to do with the need to understand the reality in which I lived to the fullest extent, in a particular way that nothing else but science seemed capable of now.

As a student of literature, I favoured the idea that stories and storytelling were the chief means through which we attempted to convey our understanding of the cosmos, and what our place was within it. And this had always been the case, at least since humans developed complex language. Highly specialised societies became the norm, and with them we lost myth as the organising narrative of our lives, but we still looked for narratives and rituals that filled its function. In every area of human activity and thought, we continued to develop stories that served to position us with respect to other beings and to fundamental principles at a cosmological or near-cosmological scale.

But one after another, the disciplines we had fractured out of myth had seemed to fail at doing justice to this role: theist religion, politics, history, and the arts had mostly downgraded or dismissed the non-human world, the vast majority of reality. And either they withdrew from the ultimate questions about the nature of the cosmos and the idea of our purpose and belonging within it, or else considered them patly resolved by some suspiciously anthropoid superpower.

But not science. I grew up with the ideas of two great humanist popularisers of science, Jacob Bronowski (*The Ascent of Man*) and Carl Sagan (*Cosmos*), intimately beamed into my adolescent brain by television. The story they told was exhilarating and beautiful. Modern science was a

hard-won triumph over bigotry and ignorance; it was the ultimate homage to nature. It had discovered many of the laws that governed the physical world, and yet there was so much more to know. Science was a great adventure, and there was room for us all to join. Carl Sagan told us that humans were ‘star stuff’, grown to be able to contemplate itself and the cosmos, and now longing to return to the stars.

Together with evolutionary biology, theoretical physics was the only contemporary endeavour seeking to present a complete picture of the cosmos and explain *how* it is and *why* it is as it is—without closing off the process at some point by attributing it all to a metaphysical dimension or super-being. I understood enough of its methods and conclusions to see that physics was striving, without any social coercion, through a union of observation and speculation, for a fundamental, all-encompassing, coherent, and beautiful picture of reality. Which was exactly what I was looking for. And with increasing urgency, in recent years, as the society that surrounded me became more fragmented, disconnected from the living world, and apparently unconcerned with any deeper understanding of it.

But now there was a problem that became clearer to me the more I read.

The picture of reality that physics has been developing since the last quarter of the 20th century is troubling: it is *not* coherent, it is *not* all-encompassing, and it cannot say what is truly fundamental. And at the same time, one of its most elegant attempts to produce a unified picture of the basic physical forces is retreating from the idea that observation and experiment are even necessary to the establishment of scientific truth.

Instead of illuminating ever more of the cosmos, theoretical physics now seems to be making it disappear in a cloud of unknowing: it proposes that the universe is almost entirely made up of matter that we cannot observe and do not understand, and that it is being torn apart by anti-gravitational energy in quantities unpredicted by any theory, whose source is also unknown. Intensely violent releases of electromagnetic radiation (observed, but again, previously unpredicted) are attributed mostly to unobservable, exotic objects whose internal physics are paradoxical. And (according to string theory) the universe is dependent for a unification of its major forces on the existence of infinitesimal extra dimensions that can never be observed or completely described because they are infinitely variable, and generate an infinity of hypothetical universes that can never have any meaningful relation to ours.

The universe described by physics today is an obscure, turbid, conflicted place, where reality at the smallest scales essentially disappears in paradox, and cannot be made continuous with reality at the largest – or even at the size of the molecule. Organic life is considered a freakish anomaly, and apparently doomed to remain so. Isolation and disorder

in the Real World Out There any more than does Keats’ ‘Ode to a Grecian Urn’ or the subject-verb-object construction of a sentence.

Ironically, of course, in climatology and zoology scientists are trying desperately to warn us of major, irrevocable changes in the biosphere, but their graphs and models have so far proved no match for the power of unimpeded flows of capital, and the unleashed infinities of human desire. Here, at the opposite end of the methodological spectrum from string theory (which achieved a kind of mainstream scientific consensus without any physical evidence whatsoever) climatologists have been laboriously accumulating data for decades and developing rigorous standards for testing theories – but nobody really wants to believe the story they are telling, because it is not about infinite possibility but about the dreary, real constraints of living systems, even at the largest scale we know.

Capital, having perfected the art of buttering its bread on both sides, thus somehow manages to benefit both from the triumph of science for the production of consumer products or infrastructure, *and* from the fear and resentment it induces in the mass imagination when it comes to the need for system-wide behaviour change.

While the scientific method is a great tool for many purposes, including an understanding of aspects of the physical world, the practice of science, like any human activity, is neither intrinsically beneficial nor destructive. Science as it is practiced today is patently not sufficient to guide humanity to a socio-ecology that is dynamic and harmonious – one that can mimic a complex ecosystem capable of thriving for hundreds of thousands of years, like a forest or a coral reef – or even the tens of thousands of years that some indigenous peoples managed without any reliance at all upon the scientific method.

On the contrary, the triumph of scientific hubris could just as well lead to our extinction. The scientific method gave humans an unprecedented power over matter – and we used it to make possible the relentlessly efficient machinery that is already facilitating climate change and the earth’s sixth great extinction of species. But somewhere else in our minds we know that unchecked aggression and hubris will destroy us too. We have a short history relative to the cosmos, but it is long enough to have given us the lessons of great failures. In fact, mythic stories recounted those truths for millennia. But a reductive materialism has degraded the meaning of myth to ‘a counterfactual belief’.

At every step, in every field, since the late 20th century, the unbuilt, pre-existing world of nature has been telling the physical sciences how far ahead of them she is. Even the mind-boggling (and beautiful) infinite recursions and bifurcations of chaos theory produce only drastically simplified approximations of common dynamic processes in nature, ones that you observe by watching a flowing stream or the passage of clouds.

perhaps, of those unruly quantum states). Anything that persistently confounds measurement is considered irrelevant, a so-called epiphenomenon. This includes all subjective experience, not to mention human consciousness itself, for many evolutionary biologists and neuroscientists. All the more so, then, any other types of consciousness there might be in other types of matter.

This view, of course, will continue to alienate us from ourselves, as it bears no relation to life as we actually experience it. 'The one reality science cannot reduce is the only reality we will ever know,' says science journalist Jonah Lehrer, defending art (including the storytelling arts) as a way of knowing, in *Proust Was a Neuroscientist* (2011).

Some scientists, like the world-famous evolutionary biologist Richard Dawkins, complain about the irrational fear of science. He is right that a blanket rejection of science is an enemy of understanding and has become a tool of dangerous reaction, particularly in the US, where it has played right into the hands of powerful backers of an ecocidal status quo. As the existential threat denialism poses becomes clearer through the haze of sponsored lies, the champions of science are gaining ground. But fighting dogma with dogma, as Dawkins does, misses the real issue: is 'faith in science' any more likely to get us into right relationship with the living world than faith in the supernatural?

For what, precisely, is irrational about fearing something demonstrably capable of erasing reality as you know it, something whose processes and mechanisms are in the hands of others who are largely unknown and completely unaccountable to you? Is it only our ignorance, or is their hubris also to blame for that fear?

Great scientists are among our modern heroes. Yet 20th-century physicists created the first weapon capable of extinguishing all life on earth. Chemists developed poison gas. Psychologists have been involved in refining torture techniques. Biologists are exuberantly manipulating genetic material in ways that could be bringing about the collapse of large-scale, complex ecosystems. They do not say no, even when the stakes are that high.

We have mapped and measured, we have formulated to degrees of complexity beyond the capacity even to measure with the tools we have – or possibly ever, in the case of some cosmological theories. And yet none of that captures essence in *any way* – nor, the most humble and righteous scientists will quietly allow – is it *meant* to. The more arrogant scientists would have us give up the idea of essence, or say that it lives Platonically in mathematics alone. But mathematics, no matter how eerily well it reproduces patterns and gives holographic representations of many aspects of the physical world, is still a human language. Our formulae do not exist

will inevitably dominate the universe as it expands and degrades, finally becoming total and eternal.

If Dante had lived today, he might have found this the perfect description of the structure of hell.

And yet, ironically, the deeper we look into space, all of what we actually see is beautiful, dynamic, multiform, filled with light and the possibilities for life – and grandly structured, with all visible matter connected in a great web that stretches across unimaginably vast distances.

But the more I read, the more I saw that the trouble with science went beyond the bizarre speculative *cul de sac* that theoretical physics seemed to have entered.

To most of us today, what physics talks about is really no different from science fiction – except that the plot is thinner. The Big Bang, black holes, wormholes, multiverses, superstrings, dark matter, dark energy – not one of us can independently confirm the existence or non-existence of these, or even grasp more than dimly the means scientists have used to hypothesise them. They are like mythological entities revealed to us by modern priests with hieratic knowledge.

This is not just because there has been a failure to teach science adequately in schools, or because our mass communications media have no incentive to convey complex information, although both of those things may be true. It is simply characteristic of societies that are highly specialised that extreme concentrations of wealth, power, and knowledge emerge. And those who possess them seek to retain their elite status, and have disproportionate leverage to do so, so the distance tends to increase.

At some point – but the big question is what point? – the anti-social effects of such concentrations of knowledge come to outweigh, even compromise, the value of the insights gained, however compelling they are. I would give you the example of the Mayan priest class' astoundingly complex and elegant understanding of time, which could not save their civilisation from the perpetual war and ecological overshoot that brought about its collapse.

I discovered that a few contemporary scientists, from within their disciplines, had begun to call out that something was wrong with the current picture. Not with the scientific method *per se*, but with science as it was actually being practiced in the 21st century. It was at risk of turning reductionism, abstract mathematics, and pet theories into dogma, of violating its own spirit of open-ended inquiry. While internal critics like biologist Rupert Sheldrake or physicist Lee Smolin approached this with their experience in and love of both theoretical and experimental science foremost, they were outriders nonetheless. They had largely been ignored or even insulted by their colleagues both for their chosen scientific approaches and their concern with the sociological ramifications of science. This was at

least in part because they were saying that science, and scientists, were not immune to behaviours that characterised the larger society.

In other words, once an omnipotent Church had tried to stifle science, but in the 21st century, science was at risk of becoming a new Church, filled with careerism, narrowness, arrogance, and orthodoxy – and now it stifled itself.

In 1996 a physicist named Alan Sokal had perpetrated a hoax that gained him notoriety throughout the academic world. He submitted an article to the journal *Social Text* called ‘Transgressing the Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity’. The article, published as written, was gibberish, purporting to Sokal that the triumph of postmodern approaches in the humanities made it impossible to distinguish profundity from tripe, or privilege the kind of falsifiable claims to truth that science prided itself upon. His demonstration was meant to prove that science would never stoop to such obscurantism or lack of rigour.

But when I read Lee Smolin’s *The Trouble with Physics* (2006), I noted that he also spoke of physics entering a ‘postmodern’ phase – by which he meant that the elaborators of theory, particularly string theory, had developed such an insular arrogance about their convoluted mathematics, and were so sure it was right, that they no longer felt constrained to defend it scientifically. In fact, he said, the mathematics produced a model of reality that was incapable of generating unique predictions testable by observation or experiment. There were also a functionally infinite number of potentially valid string theories. String theorists had unleashed a cosmological *mise en abîme*. It ironically bore some resemblance to that apocryphal little old lady’s remark about the ancient myth that the earth rested on the back of a giant turtle. What did the turtle rest on, then? It’s ‘turtles all the way down, I suppose,’ she responded.

So Smolin was claiming that physics too was guilty of postmodern obscurantism, and of succumbing to making non-falsifiable pronouncements. Sokal had scoffed at the idea that science was simply one more way humans had devised to tell themselves stories about the world. But Smolin said that the founders of quantum theory, upon discovering what’s called the ‘observer problem’ at the sub-atomic level, also became social constructionists in a way. They decided that it simply did not matter if the presence of an observer always determined what could be said about quantum states; the theory was too good to jettison. So they would give up looking for what Smolin called the Real World Out There at the smallest level, and simply keep on cataloguing the behaviour they could observe. Making Sokal seem wrong again to deride only non-scientists for saying that truth was ‘merely’ a human construct.

But even Smolin seemed not to understand just how determinative our ‘sociology’, as the frustrated scientists dismissively call it, really can be in determining what stories get told. He was an avowed believer in human progress, and surprisingly, for someone with a capacity for deep comprehension of highly complex systems in physics, it was of a reductively linear kind. He presented a thoroughly damning picture of an entire culture, and then expressed a vague hope it could all be sorted out by slight modifications in behaviour here and there.

Yet there’s considerable evidence that human social behaviours, even in the most specialised and highly technologically mediated societies, have not really evolved much in sophistication and may even be said to have regressed in some ways, compared with the prior understandings of peoples living at a much lower level of specialisation and technological intervention. For we have accepted monstrous imbalances of power and seem to have lost the determinative notion of reciprocity that gave some earlier forms of social organisation their stability. And sadly, it is science, aiding and aided by capital, which has actually been key in dismantling the idea of social and environmental reciprocity and instead justifying a profoundly anti-social and anti-ecological set of behaviours.

Above all, science is complicit because it presents us with the consensus idea that the world, at almost every level, consists solely of non-living, non-conscious material, which can thus be acted upon without the consequences of acting upon conscious living things. In fact, experimental science has shown that even other living things can be acted upon by humans in any way, exclusively for our own benefit, without the need for reciprocity of any kind. This is said to be ‘progress’ over the old, unenlightened view that the cosmos and everything in it was alive.

The model of nature accepted by the majority of contemporary scientists is that of a highly complex machine, something that – once certain unchanging laws and basic parts are identified – can essentially be manipulated at our will. Everything in the physical world also functions this way, including ourselves. The parts are separable from one another and the whole is reducible to the sum of its parts.

The reductionist consensus in biology and neuroscience, for example, sees human emotions as window dressing, basically remnants of primitive survival behaviour, now mostly just a way of gauging up our lives. They have no epistemological function and can get in the way of rational understanding. Our sensual experience is reduced to a simplistic pleasure/pain binary – instead of being a legitimate path to understanding and participating in complex, dynamic relationships without requiring the intervention of technology or oversight from the rational mind.

The scientific method must dismiss anything that anything that cannot be measured with ever-increasing precision (with the exception,